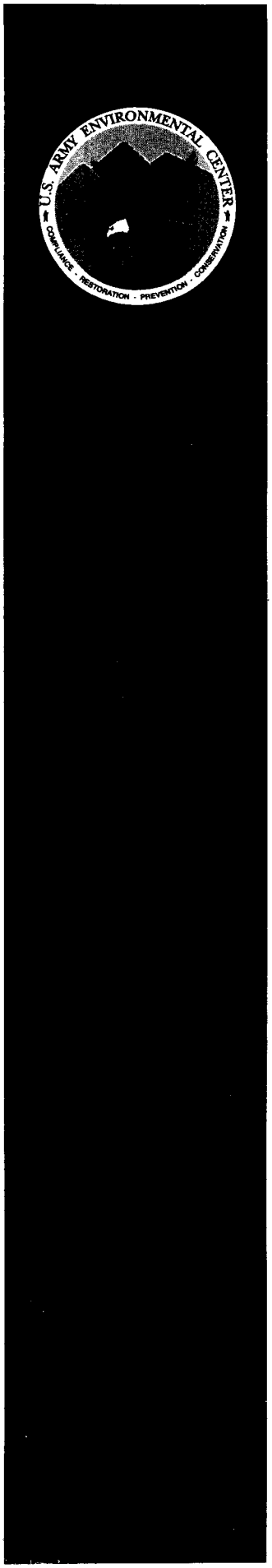

CONTRACT NO. DAAA15-94-D-0012
Task Order 02

FINAL RECORD OF DECISION FOR THE SOUTH POST IMPACT AREA AND AREA OF CONTAMINATION 41 GROUNDWATER AND AREAS OF CONTAMINATION 25, 26, AND 27

July 1996

Prepared for:

U.S. ARMY ENVIRONMENTAL CENTER
Base Realignment and Closure Division
Aberdeen Proving Ground, Maryland 21010-5401

Prepared by:

Horne Engineering Services, Inc.
4501 Ford Avenue, Suite 1100
Alexandria, VA 22302

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DECLARATION FOR THE RECORD OF DECISION

SOUTH POST IMPACT AREA AND AREA OF CONTAMINATION 41 GROUNDWATER AND AREAS OF CONTAMINATION 25, 26, AND 27 FORT DEVENS, MASSACHUSETTS

STATEMENT OF PURPOSE

In December 1989, Fort Devens was listed as a National Priorities List (NPL) site under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The Fort is located in Middlesex and Worcester counties and is within the towns of Ayer, Harvard, Lancaster, and Shirley, Massachusetts. Seventy-three study areas (SAs) and areas of contamination (AOCs) at Fort Devens have been investigated under CERCLA.

This Record of Decision (ROD) addresses AOCs 25 (Explosive Ordnance Disposal (EOD) Range), 26 (Zulu Ranges), and 27 (Hotel Range) and AOC 41 groundwater and a subset of the groundwater within the South Post Impact Area (SPIA). This subset is located north and west of the groundwater divide and covers approximately 964 acres. This area is referred to in this document as the "SPIA monitored-area" and is shown in Figure 1 of Appendix A. The SPIA is approximately 1,500-acre and is located within the 4,800-acre South Post section of Fort Devens. This Record of Decision presents the selected remedial action for the site, chosen in accordance with CERCLA as amended by the Superfund Amendments and Reauthorization Act (SARA), and, to the extent practicable, the National Contingency Plan (NCP). This ROD does not affect assessment or remedial activities on areas not specifically mentioned herein.

AOC 41 groundwater has been added to this ROD since the public meeting based on the results of the Final Remedial Investigation (RI) completed for AOC 41 (February 1996). The RI indicates that proposed actions are the same for the SPIA monitored-area and AOC 41 groundwater, AOC 41 is adjacent to the SPIA monitored-area, and AOC 41 is small in area (6 acres). Adding AOC 41 to this ROD would only increase the total land area covered in this ROD by 0.6 percent. Therefore, the U.S. Environmental Protection Agency-(USEPA) New England (Region I) recommended including AOC 41 groundwater in this ROD.

The Fort Devens Base Realignment and Closure (BRAC) Environmental Coordinator, the Commander Devens Reserve Forces Training Area (RFTA), and the USEPA-New England Administrator have been delegated the authority to approve this ROD.

The Commonwealth of Massachusetts has concurred with the selected remedy. A copy of the declaration of concurrence is included as Appendix B of this ROD.

STATEMENT OF BASIS

This decision is based on the Administrative Record for the site that was developed in accordance with Section 113(k) of CERCLA. The Administrative Record is available for public review at the Fort Devens BRAC Environmental Office, Building P12, Fort Devens, Massachusetts, and the Ayer Town Hall, Main Street, Ayer, Massachusetts. The Administrative Record Index (Appendix C of the ROD) identifies each of the items composing the Administrative Records upon which the selection of the remedial action is based.

ASSESSMENT OF THE SITE

Risk assessment results show that human health risks were identified to be within USEPA risk guidelines for the pathways that were assessed. Risk to on-site ecosystems, in some instances, were found to be outside of USEPA risk guidance; however, their impacts were deemed acceptable.

DESCRIPTION OF SELECTED REMEDY

"No action" is the selected remedy for SPIA monitored-area groundwater, AOC 41 groundwater, and the surface water, sediment, and soils at the EOD, Zulu, and Hotel Ranges. Under this alternative, no formal remedial action will be taken and the site will be left "as is," with no additional institutional controls, containment, removal, treatment, or other mitigating measures. Long-term groundwater monitoring will be conducted at the site under this "no action" ROD.

The Army along with USEPA-New England and Massachusetts Department of Environmental Protection (MADEP) will develop and implement a long-term Integrated Natural Resources Management Plan and a Groundwater Monitoring Plan for the South Post of Fort Devens. These plans will be developed within 6 months of ROD signature.

Should the Army close or transfer or change the use of the property an Environmental Baseline Survey (EBS) will be conducted, and the "no action" decision of this ROD will be re-examined in light of the changed risk factors resulting from this closure/transfer. The EBS will be provided to the USEPA-New England and MADEP for comment.

DECLARATION STATEMENT

No remedial action is necessary to ensure the protection of human health and the environment unless the land use changes. Under CERCLA, any action that results in contaminants remaining on-site must be reviewed at least every 5 years. During 5 year reviews, an assessment is made of whether the implemented remedy remains protective of human health and the environment and whether alternative remedial actions are needed to ensure adequate protection.

The foregoing represents the selection of a remedial action by the Department of the Army and the USEPA-New England, with the concurrence of the Commonwealth of Massachusetts (MADEP). Concur and recommend for immediate implementation:

UNITED STATES DEPARTMENT OF THE ARMY

James C Chambers

JAMES C. CHAMBERS
Fort Devens
BRAC Environmental Coordinator

27 JUNE 1996
Date

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The foregoing represents the selection of a remedial action by the Department of the Army and the USEPA-New England, with the concurrence of the Commonwealth of Massachusetts MADEP. Concur and recommend for immediate implementation:

UNITED STATES DEPARTMENT OF THE ARMY

H. Carter Hunt, Jr.
Commander
Devens Reserve Forces Training Area (RFTA)

28 June 1996
Date

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The foregoing represents the selection of a remedial action by the Department of the Army and the USEPA-New England, with the concurrence of the Commonwealth of Massachusetts MADEP. Concur and recommend for immediate implementation:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Linda M. Murphy
Director of the Office of Site Remediation and Restoration

July 5, 1996
Date

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RECORD OF DECISION SUMMARY
SOUTH POST IMPACT AREA AND
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EXECUTIVE SUMMARY

Fort Devens is located in Middlesex and Worcester counties and is within the towns of Ayer, Harvard, Lancaster, and Shirley, Massachusetts. Seventy-three study areas (SAs) and areas of contamination (AOCs) at Fort Devens have been investigated for potential environmental restoration.

This Record of Decision (ROD) addresses AOCs 25 (the Explosives Ordnance Disposal (EOD) Range), 26 (Zulu Ranges), and 27 (Hotel Range) and a subset of the groundwater within the South Post Impact Area (SPIA). This subset is located north and west of the groundwater divide and covers approximately 964 acres. This area is referred to in this document as the "SPIA monitored-area" and is shown in Figure 1 of Appendix A.

AOC 41 groundwater has been added to this ROD since the public meeting. The logic for including the AOC 41 groundwater in this ROD is based on the results of the Final Remedial Investigation (RI) completed for AOC 41 (February 1996). The RI indicates that (1) proposed actions are the same for the SPIA monitored-area and AOC 41 groundwater, (2) AOC 41 is adjacent to the SPIA monitored-area, and (3) AOC 41 is small in area (6 acres). Adding AOC 41 to this ROD would only increase the total land area covered in this ROD by 0.6 percent. The details of AOC 41 groundwater are presented in Section IX of this ROD. The landfill portion of AOC 41 will be addressed under a separate action.

This ROD presents the selected remedial action for the site, chosen in accordance with Comprehensive Environmental Response Compensation and Liability Act (CERCLA), as amended by Superfund Amendments and Reauthorization Act (SARA), and, to the extent practicable, the National Contingency Plan (NCP). This decision is based on the Administrative Record for the site. The Administrative Record is a collection of all the documents used by the Army in determining the most appropriate action to take at the SPIA monitored-area. The Administrative Record is available for public review at the Fort Devens Base Realignment and Closure (BRAC) Environmental Office and the Ayer Town Hall, Ayer, Massachusetts. This ROD does not affect assessment or remedial activities on areas not specifically mentioned herein.

The entire SPIA is approximately 1,500 acres and is located within the 4,800-acre South Post section of Fort Devens. The SPIA is, and will be for the foreseeable future, an active weapons and ordnance discharge area used by the Army, the Massachusetts National Guard, and nearby law enforcement agencies for training purposes.

Metals, organic compounds, petroleum hydrocarbons, and explosive chemicals were detected in soil, sediments, groundwater, and surface water during the Remedial Investigation (RI) of SPIA monitored-area groundwater and the EOD, Zulu, and Hotel Ranges. Using data from the RI, the Army prepared a Baseline Risk Assessment to determine potential risks to human health and the environment under reasonable exposure assumptions.

No unacceptable risks to human health and the environment were found to be associated with the SPIA monitored-area groundwater, even though levels exceeded Army and USEPA action levels. No hazardous substances were detected in the one drinking water well on the South Post, Well D-

1. Well D-1, which is located near the northeast edge of the SPIA monitored-area, is used on a limited basis by military personnel during training activities. Also, no unacceptable ecological risk to surrounding habitats were found to be associated with the SPIA monitored-area groundwater due to the absence of a pathway for any known ecological receptor to access the SPIA monitored-area groundwater.

Risk assessment results for the EOD, Zulu, and Hotel Ranges show that human health risks were identified to be within USEPA risk guidelines for assessed pathways. Risk to on-site ecosystems, in some instances, were found to be outside of USEPA risk guidance; however, ecological risks identified on the EOD, Zulu, and Hotel Ranges were deemed to be acceptable due to the continued use of the Impact Area for military training activities. Risk assessment results for AOC 41 show that there is no unacceptable risk to human health from the groundwater at the South Post Well D-1 nor are site-related contaminants adversely impacting ecological receptors in New Cranberry Pond.

"No action" is the selected remedy for the SPIA monitored-area groundwater and AOC 41 groundwater. Under this alternative, no formal remedial action is taken and the site is considered to be left "as is," with no additional institutional controls, containment, removal, treatment, or other mitigating measures. "No action" is also the selected remedy for the surface water, sediment, and soil at the EOD, Zulu, and Hotel Ranges. The Army has submitted a Closure Report under the Resource Conservation and Recovery Act (RCRA) Subpart X; formal approval of the closure of EOD Range will occur prior to ROD signature.

As part of this remedy, Fort Devens will ensure the following:

- Groundwater monitoring for potential contaminant migration out of the SPIA monitored-area will continue:
  - Wells will be used to monitor the groundwater from the EOD Range, Zulu Ranges, Hotel Range, and AOC 41.
  - Wells will be used to monitor the north, northeast, southeast, and east sides of the SPIA monitored-area.
- The monitoring wells will be sampled for explosives, Target Compound List (TCL), and the Target Analyte List (TAL) metals.
- A Groundwater Monitoring Plan for the South Post will be developed that will include detailed groundwater monitoring at discharge points. The plan may include installing sentinel wells to monitor potential off-site groundwater flow. Details of the plan will be developed jointly by the Army, USEPA-New England, and Massachusetts Department of Environmental Protection (MADEP) within 6 months of ROD signature. The Army will rerun the groundwater model to incorporate data from new sentinel well(s) and ascertain any potential impacts to MCI Shirley.

- Well D-1 will be sampled and analyzed for explosives and Massachusetts and Federal drinking water requirements (MMCLs/MCLs).

- The Army will not develop new drinking water sources within the SPIA monitored-area.

- An Integrated Natural Resources Management Plan will be developed and implemented to monitor the impacts to ecosystems in the SPIA monitored-area. The details of this plan will be developed jointly by the Army, USEPA-New England, U.S. Fish and Wildlife Service, and MADEP within 6 months of the ROD signature.

Monitoring reports will include a description of site activities and a summary of analytical results. The Army will review and submit these monitoring reports to MADEP and USEPA annually. If there is an indication of contamination emanating from the SPIA monitored-area, the Army will evaluate the need for additional assessment.

This site, as required by CERCLA, will be subject to 5 year reviews. During a 5 year review, an assessment is made as to whether the implemented remedy is protective of human health and the environment and whether the implementation of alternative remedial actions are needed to ensure adequate protection. If on-site hazardous substances, pollutants, or contaminants that may present an imminent and substantial endangerment to public health and welfare migrate off site, the Army will take the necessary and appropriate actions to protect human health and the environment as required under CERCLA. More frequent reviews will be conducted if site conditions change. Should the Army close or transfer or change the use of the property an Environmental Baseline Survey (EBS) will be conducted, and the "no action" decision of this ROD will be re-examined in light of the changed risk factors resulting from this closure/transfer. The EBS will be provided to the USEPA-New England and MADEP for comment.

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RECORD OF DECISION SUMMARY
SOUTH POST IMPACT AREA AND
AREA OF CONTAMINATION 41 GROUNDWATER AND
AREAS OF CONTAMINATION 25, 26, AND 27
FORT DEVENS, MASSACHUSETTS

June 18, 1996

I. SITE NAME, LOCATION, AND DESCRIPTION

In December 1989, Fort Devens was listed as a National Priorities List (NPL) site under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The Fort is located in Middlesex and Worcester counties and is within the towns of Ayer, Harvard, Lancaster, and Shirley, Massachusetts, approximately 35 miles west of Boston. Seventy-three study areas (SAs) and areas of contamination (AOCs) at Fort Devens have been investigated for potential environmental restoration.

This Record of Decision (ROD) addresses AOCs 25 (the Explosives Ordnance Disposal (EOD) Range), 26 (Zulu Ranges), and 27 (Hotel Range) and a subset of the groundwater within the South Post Impact Area (SPIA). This subset is located north and west of the New Cranberry Pond/unnamed stream groundwater divide and covers approximately 964 acres. This area is referred to in this document as the "SPIA monitored-area" and is shown in Figure 1 of Appendix A.

AOC 41 groundwater has been added to this ROD since the public meeting. The logic for including the AOC 41 groundwater in this ROD is based on the results of the Final Remedial Investigation (RI) completed for AOC 41 (February 1996). The RI indicates that (1) proposed actions are the same for the SPIA monitored-area and AOC 41 groundwater, (2) AOC 41 is adjacent to the SPIA monitored-area, and (3) AOC 41 is small in area (6 acres). Adding AOC 41 to this ROD would only increase the total land area covered in this ROD by 0.6 percent. The details of AOC 41 groundwater are presented in Section IX of this ROD. The landfill portion of AOC 41 will be addressed under a separate action.

The entire SPIA covers approximately 1,500 acres and is located within the 4,800-acre South Post section of Fort Devens (Figure 1 of Appendix A). The SPIA is an active weapons and ordnance discharge area used by the Army, the Massachusetts National Guard, and nearby law enforcement agencies for training purposes. The area is generally bounded by Old Turnpike Road, Firebreak Road, the southern portion of Harvard Road, Trainfire Road, and Dixie Road. The SPIA covers AOCs 25, 26, 27, and 41 as well as several SAs, and a number of other firing ranges along Dixie Road and Trainfire Road that are not designated as AOCs.

This ROD presents the selected remedial action for the site, chosen in accordance with CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA) and, to the extent practicable, the National Contingency Plan (NCP). This decision is based on the Administrative Record for the site.

EOD Range (AOC 25) is located east of Firebreak Road, approximately 2 miles south of the main entrance to the South Post. The site is rectangular and measures approximately 600 feet by 1,500 feet.

Zulu Ranges (AOC 26) are located 2,000 feet north of the EOD Range (AOC 25), approximately 1.6 miles southwest of the main entrance to the South Post. The Zulu Ranges cover approximately 16 acres and consist of two adjacent land tracts (Zulu 1 and Zulu 2). Zulu 1 and 2 cover approximately 10 and 6 acres, respectively.

Hotel Range (AOC 27) is adjacent to Cranberry Pond and is located approximately 1 mile south of the main entrance to the South Post. The Hotel Range covers approximately 23 acres and is currently used exclusively for firing small-caliber automatic weapons. The area of concern where open burning/open detonation (OB/OD) occurred is located exclusively south of the Old Turnpike Road.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

A. Land-Use and Response History

Fort Devens was established as Camp Devens in 1917. It was used as a temporary training camp for soldiers from the New England area. The camp became a permanent installation in 1931 and was renamed Fort Devens. Throughout its history, Fort Devens has served as a training and induction center for military personnel and as a unit mobilization and demobilization area. The installation was used in this capacity, to varying degrees, during World Wars I and II, the Korean War, the Vietnam Era, and operations Desert Shield and Desert Storm. The primary mission of Fort Devens is to command, train, and provide logistical support for nondivisional troop units and to support and execute Base Realignment and Closure (BRAC) activities. The installation also supports the Army Readiness Region and the National Guard units in the New England area.

The South Post consists mainly of undeveloped and under-developed land. In the past, some timbering and limited farming have taken place. The ranges on the South Post are currently used for various types of artillery and small arms fire, grenade detonation, and ordnance demolition. Managed forest accounts for much of the remainder of the area.

At least some portion of the SPIA has been used for military training since the inception of Fort Devens as Camp Devens in 1917. At various times, demolition training and OB/OD have been conducted at the EOD, Zulu, and Hotel Ranges. A discussion of land-use activities at these ranges follows.

EOD Range (AOC 25) — From 1979 to 1992, approximately 1,200 pounds per year of explosives and ammunition were disposed of in the disposal area by OB/OD. A 1-acre disposal area is located along the southeastern boundary of the range. The Army has submitted a Closure Report under the Resource Conservation and Recovery Act (RCRA) Subpart X; formal approval

of the closure of EOD Range will occur prior to ROD signature. Currently, the range operates under a RCRA emergency permit and is used once or twice a year.

Zulu Ranges (AOC 26) — Prior to 1979, the range was used for OB/OD of waste explosives and associated waste items. Zulu 1 is primarily used for demolition training. The demolition training area is located in the center of Zulu 1. Zulu 2 is used primarily as a practice range for hand grenade training. The grenade training area is located on the eastern end of Zulu 2 and consists of two concrete bunkers, which are used for cover and protection, and two sand pits, which are used for receiving grenades.

Hotel Range (AOC 27) — Before 1979, the Hotel Range was used for OB/OD of small arms, smoke grenades, and pyrotechnics. After 1979, the Hotel Range was modified and extended to the north side of the Old Turnpike Road and used for M-16s and small caliber weapons. Prior to 1989, the range was used as an M-70 range, but after 1989 the range was modified to an M60-SAW range.

B. Enforcement History

In conjunction with the Army's Installation Restoration Program (IRP), Fort Devens and the U.S. Army Environmental Center (USAEC; formerly the U.S. Army Toxic and Hazardous Materials Agency) initiated a Master Environmental Plan (MEP) in 1988. The MEP assesses the environmental status of SAs, specifies necessary investigations, and provides recommendations for response actions with the objective of identifying priorities for environmental restoration at Fort Devens. The MEP recommended that a record search be conducted to better define past and current activities. It also recommended that the extent of contamination be determined by collecting soil samples and analyzing the samples for the United States Environmental Protection Agency (USEPA) hazardous substance list compounds and total petroleum hydrocarbons (TPHC). The MEP also suggested installing monitoring wells if hazardous substances were detected in deeper soils.

On December 21, 1989, Fort Devens was placed on the NPL. Fort Devens was listed as an NPL site because hazardous substances were detected at two sites other than the EOD, Zulu, and Hotel Ranges (volatile organic compound (VOC) contamination in the groundwater at the Shepley's Hill Landfill and metal contamination in the groundwater at the Cold Spring Brook Landfill). A Federal Facilities Interagency Agreement (IAG) was developed and signed by the Army and USEPA-New England (Region I) on May 13, 1991 and finalized on November 15, 1991. The IAG provides the framework for implementing the CERCLA/SARA process at Fort Devens.

Under Public Law 101-510, the Defense Base Realignment and Closure Act of 1990, Fort Devens was selected for cessation of operations and closure. However, the SPIA will be retained by the Army for continued use as a training range. An important aspect of BRAC actions is to determine environmental restoration requirements before property transfer can be considered. As a result, an Enhanced Preliminary Assessment (PA) was performed at Fort Devens to address areas not

normally included in the CERCLA process, but that required review prior to base closure. Although the Enhanced PA covers MEP activities, its main focus is to determine if additional areas require detailed records review and site investigation. The Enhanced PA also provides information and procedures to investigate installation-wide areas requiring environmental evaluation. A final version of the Enhanced PA report was completed in April 1992.

RIs were prepared for the SPIA monitored-area groundwater and EOD, Zulu, and Hotel Ranges. These were submitted to the USEPA-New England and the Massachusetts Department of Environmental Protection (MADEP) in August 1994. A Proposed Plan and summary Fact Sheet have been prepared for the SPIA monitored-area groundwater and EOD, Zulu, and Hotel Ranges. These documents have been placed in the Administrative Record and are available for public review at the Fort Devens BRAC Environmental Office and the Ayer Town Hall, Ayer, Massachusetts.

III. COMMUNITY PARTICIPATION

The Army has kept the community and other interested parties apprised of site activities through regular and frequent informational meetings, fact sheets, press releases, and public meetings.

After receiving public comments on an earlier draft, the Army released a final Community Relations Plan in February 1992. The plan outlines a program to address community concerns and inform citizens, as well as involve them in activities during remedial activities. As a part of this plan, the Army established a Technical Review Committee (TRC) in March 1991. The TRC, as required by SARA Section 211 and Army Regulation 200-1, includes representatives from USEPA-New England, USAEC, Fort Devens, the MADEP, local officials, and the community. The committee provided review and technical comments on work products, schedules, work plans, and proposed activities for the SAs at Fort Devens. The RI and Feasibility Study (FS) Reports, Proposed Plan, and other related support documents were all submitted to the TRC for their review and comment. Additionally, the SPIA monitored-area groundwater and EOD, Zulu, and Hotel Range activities were specifically discussed at TRC meetings held September 29, 1992; March 31, 1993; and January 26, 1994. A Citizen's Advisory Committee (CAC) was also established to address Massachusetts Environmental Policy Act (MUSEPA)/Environmental Assessment issues concerning the reuse of property at Fort Devens.

The TRC typically met quarterly until January 1994, when it was replaced by the Restoration Advisory Board (RAB). As part of the Army's commitment to involving the affected communities, a RAB is formed when an installation closure involves transfer of property to the community. The RAB was formed in February 1994 to join members of the CAC with current TRC members. The RAB consists of 28 members (15 original TRC members plus 13 new members) who are representatives from the Army, USEPA-New England, MADEP, local governments, and citizens of the local communities. It meets monthly. Specific responsibilities include addressing cleanup issues such as land use and cleanup goals, reviewing plans and documents, identifying proposed requirements and priorities, and conducting regular meetings

that are open to the public. The proposed plan for the SPIA monitored-area groundwater and EOD, Zulu, and Hotel Ranges was presented at the February 1, 1996 RAB meeting.

During the week of January 29, 1996 the Army published a public notice concerning the Proposed Plan and public hearing in the Lowell Sun, The Public Spirit (Ayer), and the Fort Devens Chronicle and distributed a summary Fact Sheet to 647 interested parties. The Army also made the Plan available to the public at Fort Devens BRAC Environmental Office and the Ayer Town Hall.

From February 1 to March 1, 1996, the Army held a 30-day public comment period to accept public comments on the alternatives presented in the Proposed Plan, as well as other documents released to the public. On February 21, 1996 the Army held a formal public meeting at Fort Devens to discuss the Proposed Plan and to accept any verbal comments from the public. A transcript of this meeting and the comments and the Army's response to comments are included in the attached responsiveness summary (Appendix D).

All supporting documentation for the decision regarding the SPIA monitored-area groundwater and the EOD, Zulu, and Hotel Ranges has been placed in the Administrative Record for review. The Administrative Record is a collection of all the documents considered by the Army in choosing the remedy for the SPIA monitored-area groundwater and the EOD, Zulu, and Hotel Ranges. The Administrative Record is available for public review at the Fort Devens BRAC Environmental Office and at the Ayer Town Hall, Ayer, Massachusetts. An index to the Administrative Record is available at the USEPA-New England Records Center, 90 Canal Street, Boston, Massachusetts and is provided as Appendix C. In addition, information repositories that contain information relative to ongoing Fort Devens environmental actions are located in the Lancaster, Shirley, Harvard, and Ayer libraries.

IV. SCOPE AND ROLE OF THE RESPONSE ACTION

The remedy selected for the SPIA monitored-area groundwater and EOD, Zulu, and Hotel Ranges is protective of human health and the environment. Risks to human health were found to be within USEPA guidelines, while risks to ecological receptors were found to be minimal. The risks to on-site ecosystems were deemed acceptable. However, the Army, once the final ROD is approved, will develop long-term plans for an Integrated Natural Resources Management Plan to address identified concerns. This plan will be completed within 6 months of ROD signature.

The Army proposes "no action" for the SPIA monitored-area groundwater and the EOD, Zulu, and Hotel Ranges. The Army will maintain control of the South Post for future military training activities. Public access to the site will continue to be restricted, and unauthorized personnel will be prohibited. Currently, the South Post is enclosed by a fence and access can only be gained through gates that are controlled by the Army Range Control. However, if the Army were to relinquish control and release the land for other purposes, additional assessments will be required depending on the reuse of the property.

V. SUMMARY OF SITE CHARACTERISTICS

RIs were conducted for the EOD, Zulu, and Hotel Ranges to characterize the nature and extent of site-related contamination. Samples from groundwater, surface water, sediments, and soil were taken. Chemical analyses were performed on the samples taken from the various media, and the results were compared with screening values previously developed. The results of the chemical analyses were reviewed to determine whether hazardous substances detected were related to site activities or were naturally occurring. A detailed presentation of the range characteristics is presented in Volumes II, III, and IV of the RI report for the EOD, Zulu, and the Hotel Ranges, respectively.

A. Groundwater

Groundwater at Fort Devens occurs largely in the permeable glacial-deltaic outwash deposits of sand, gravel, and boulders. Groundwater is found under the South Post at depths of 0 to 30 feet. The flow of groundwater on the South Post is determined by the bedrock and till topography. A number of springs can be found around the circumference of SPIA.

The SPIA can be regarded as predominantly two hydrologic units, one of which drains to the west and north and the other to the south and east. These units are determined by the bedrock ridge which forms a groundwater divide across the northern portion of the SPIA. As a result of this ridge, groundwater from the Zulu and Hotel Ranges and Cranberry Pond in the northeast corner of the SPIA flows north into Slate Rock Brook and Slate Rock Pond. At the same time, groundwater from the EOD Range and most of the remaining portions of the SPIA flows southeast and east to the unnamed brook and New Cranberry Pond or to the north of New Cranberry Pond directly to the Nashua River and its wetland.

Groundwater in the vicinity of the ranges discharges to surface water before it leaves the South Post. More than 50 percent of the SPIA overlies a medium yield aquifer that is a potential source of drinking water. MADEP concurrence with this ROD constitutes MADEP's agreement that the site is adequately regulated under the provisions of 310 CMR 40,000, the Massachusetts Contingency Plan. Measurements of hydraulic head in the groundwater and in streams and ponds within the South Post show that the streams around the SPIA are gaining streams (i.e., groundwater discharges into the streams).

Fort Devens withdraws groundwater from wells on the Main Post and the North Post. The Fort maintains a transient noncommunity[1] supply well, Well D-1, on the South Post along Dixie Road at Echo Range (E) near the north end of Alpha Range (A) (Figure 1 of Appendix A). This well is not used to serve the general public, but is used to supply troops who train on the South Post.

[1] Transient noncommunity water system serve at least 25 people per day for at least 60 days per year, but not the same 25 people each day. Examples include parks, wayside rests, small-sized resorts and hotels, restaurants, bars, and campgrounds.

These troops spend no more than 2 weeks per year at the site. Fort Devens Range Control Staff do not use this well and there are no plans to provide connections to the Range Control Offices.

Groundwater quality samples collected from Well D-1 show that no chemicals or metals were detected at concentrations above USEPA guidelines. Specifically, five samples have been collected from Well D-1 (May 1991, June 1991, two samples in April 1992, and March 1993) and were analyzed for USEPA's Target Analyte List (TAL) metals, USEPA's Target Compound List (TCL), total organic carbon (TOC), and water quality parameters. A summary of results is presented in Table 1 in Appendix E. Only one chemical, bis(2-ethylhexyl)phthalate, exceeded a screening value (USEPA's Maximum Contaminant Level (MCL)). As two of the samples show no detectable concentration of bis(2-ethylhexyl)phthalate, the RI Report attributes the finding of this chemical to sampling or laboratory error.

Groundwater quality samples for the EOD and Zulu Ranges were taken in November 1992, March 1993, and June 1993 (Figures 2 and 3 of Appendix E show well locations). Samples were collected from eight monitoring wells at the EOD Range and seven wells at the Zulu Ranges. At the Hotel Range, groundwater samples from four wells were taken in September 1992 and January 1993, and an additional six wells were sampled as part of the RI in August and November 1993 (Figure 4 of Appendix A shows well locations).

The samples taken at the EOD Range were analyzed for TAL metals and explosives, as well as hardness. The samples taken at the Zulu Ranges were analyzed for TCL organics, TAL metals, explosives, and TPHC, as well as hardness. Samples taken at the Hotel Range were analyzed for TAL metals, TCL pesticides, explosives, TPHC, and water quality parameters.

EOD Range (AOC 25) — Unfiltered samples from the EOD Range showed levels of iron, aluminum, and other metals above the concentrations found in local background samples. Background samples are those collected in a similar medium (i.e., water, soil, sediment) that are not believed to be contaminated. Samples that were filtered to eliminate suspended solids (i.e., soil and sediments to which metals may adhere) and measure only the metal dissolved in the water, showed concentrations several orders of magnitude lower than in the unfiltered samples (Tables 2 and 3 of Appendix E). Manganese and calcium exceeded background concentrations in filtered samples. None of the metals in filtered samples, however, exceeded health-based screening values described in the RI report. Four explosives or explosive-related organic compounds (cyclonite (RDX), cyclotetramethylene tetranitramine (HMX), pentaerythritol tetranitrate (PETN), and trinitrotoluene (TNT)) were also detected in the samples. Only RDX exceeded the screening value. Organic compound results are shown on Figure 5 of Appendix A.

Zulu Ranges (AOC 26) — Metals concentrations in the Zulu Ranges groundwater samples (unfiltered) were higher than concentrations found in local background samples. As with the samples collected in the EOD, filtered samples showed lower concentrations than the unfiltered samples in the Zulu Ranges (Tables 4 and 5 of Appendix E). The maximum concentration of

manganese in filtered samples (62 micrograms per liter, (µg/L)) exceeded the screening value[2](50 µg/L). Several explosives or explosive-related organic compounds (RDX, HMX, and TNT) were also detected in these samples. RDX at 390 µg/L exceeded its health-based screening value[3](2 µg/L). The monitoring wells showing the most significant concentrations of explosives-related substances are located where grenade-throwing and demolition are practiced. The groundwater from the Zulu Ranges discharges to surface water located within the South Post. Organic compound results are shown on Figure 6 of Appendix A.

Hotel Range (AOC 27) — Metals concentrations in the EOD Range groundwater samples (unfiltered) also exceeded concentrations found in local background samples. Filtered samples showed lower concentrations than the unfiltered samples (Tables 6 and 7 of Appendix E). The maximum concentration of manganese in filtered samples (74.1 µg/L) exceeded the screening value of 50 µg/L. In addition, aluminum at concentrations up to 72.3 µg/L exceeded the screening value[4](50 µg/L) in some filtered samples. All wells in this area indicated some level of explosives contamination. RDX (up to 17.9 µg/L) and 1,3-dinitrobenzene (up to 1.82 µg/L) exceeded their screening values[5](2 µg/L and 1 µg/L, respectively). Organic compound results are shown on Figure 7 of Appendix A.

Summaries of groundwater sample results for the EOD, Zulu, and Hotel Ranges are presented in Tables 2 through 7 in Appendix E. Complete analytical results are presented in the RI Report.

B. Surface Water

The SPIA is drained primarily by two streams, Slate Rock Brook north and west of the SPIA monitored-area and an unnamed stream in the southeast portion of the site.

EOD Range (AOC 25) — No surface water is known to exist within or adjacent to the EOD. During the RI, one surface water sample was collected from the emergence of Slate Rock Brook near the EOD Range, although the RI report notes that the sample is not representative of surface water originating at the EOD Range. This sample was analyzed for TAL metals, TCL organics, explosives, and water quality parameters. Several metals in the sample exceeded USEPA's Ambient Water Quality Criteria (AWQC) for the Protection of Aquatic Organisms (Freshwater Chronic)[6]. Sample analysis results are presented in Table 8 of Appendix E.

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[2] Massachusetts Secondary Maximum Contaminant Levels (MCL).

[3] USEPA Office of Water Lifetime Health Advisory level.

[4] Massachusetts Secondary MCL.

[5] USEPA Office of Water Lifetime Health Advisory level.

[6] The analytical data and other information presented in the RI report indicate that the surface water samples were not filtered. The concentrations of metals detected may reflect the presence of solids in the samples. Metals that adhere to the suspended solids may pose less risk to aquatic organisms potentially of concern because the metals may not be "bioavailable."

Zulu Ranges (AOC 26) — Thirteen surface water samples were collected for the RI from wetlands and drainage areas potentially affected by activities at the Zulu Ranges. Figure 8 of Appendix A shows surface water sampling locations in the Zulu Ranges. These 13 samples were analyzed for TCL organics, TAL metals, explosives, TPHC, and water quality parameters. Sample analysis results are presented in Table 9 of Appendix E.

Analysis of the Zulu Range samples collected during the RI showed two metals exceeding USEPA AWQC: arsenic detected at a concentration of 7.18 µg/L (AWQC of 0.018 µg/L) and lead at a maximum concentration of 106 µg/L (AWQC of 3.2 µg/L). Earlier samples collected as part of a previous investigation, the Site Inspection (SI), showed higher concentrations than those found in the RI samples. The differences between the two investigations may reflect different sampling methods, field conditions, or laboratory procedures. Explosives (including RDX and HMX), as well as several organic compounds, were detected in samples from the Zulu Ranges. One of the thirteen samples contained a detectable concentration of DDD (0.086 µg/L) that exceeded the AWQC (0.00083 µg/L).

Hotel Range (AOC 27) — Nine surface water samples were collected for the RI within Cranberry Pond, adjacent to the Hotel Range. (Three samples had been collected earlier during the SI.) The six RI samples were analyzed for TCL, VOCs, pesticides, and polycyclic aromatic hydrocarbons (PAHs); TAL metals; explosives; TPHC; and water quality parameters. Figure 4 of Appendix A shows surface water sampling locations in the Hotel Range. Sample analysis results are presented in Table 10 of Appendix E

Several metals were detected in the surface water samples collected in the Hotel Range. One metal, lead, was detected at a concentration of 18.2 µg/L, which exceeded the AWQC (3.2 µg/L). Trace levels of explosives or explosive-related compounds were detected in these samples.

Complete analytical results are presented in the RI report.

C. Sediments

Samples of sediments were taken in conjunction with the surface water samples discussed above. The samples taken at the EOD Range, Zulu Ranges, and Hotel Range were analyzed for TAL metals, TCL organics, explosives, TPHC, TOC, and grain size.

EOD Range (AOC 25) — Several metals in the EOD Range sample exceeded the concentrations detected in a local background sediment sample. Sample analysis results are presented in Table 11 of Appendix E.

Zulu Ranges (AOC 26) — Most metals in the Zulu Range samples were detected above background concentrations in at least one sample. Explosives, pesticides, VOCs, and TPHC were also detected. Sample analysis results are presented in Table 12 of Appendix E. No screening values were established in the RI for organic compounds in sediments.

Hotel Range (AOC 27) — Most samples collected in Cranberry Pond contained some metal concentrations in excess of those naturally occurring in the sediment. However, the data indicate that only one sample is unequivocally contaminated with metals. The explosive 4-amino-2,6-dinitro toluene was detected in one third of the samples. VOCs, pesticides, TPHC, and two PAHs: benzo(b)fluoranthene and pyrene were also detected. Sample analysis results are presented in Table 13 of Appendix E. Complete analytical results are presented in the RI report.

D. Soils

The predominant soil in the South Post, including the areas of investigation, is the Hinkley-Merrimac-Windsor (HMW) association. This soil consists of loams or sandy loams, loamy fine sands, and other sands over sand or sand and gravel. In the active ranges, including the EOD, Zulu, and Hotel Ranges, the natural soils are disturbed. A soil mapping of the SPIA monitored-area found that, almost without exception, the soils are sandy and well drained. The exceptions are in wetland areas outside the three ranges.

EOD Range (AOC 25) — Surface and subsurface soil samples collected during the RI at the EOD Range in November 1993 were analyzed for TAL metals, explosives, and TPHC. Figure 8 of Appendix A shows soil sampling locations in the EOD Range. Several metals were detected at levels above background in at least one sample. Copper and zinc exceeded the background concentration in three surface samples. Two explosives were also detected in EOD Range surface soil samples: nitrocellulose (detected in two samples) and nitroglycerine (detected in one sample). Low levels of TPHC were detected (maximum concentration of 45.2 µg/g). None of the substances detected exceeded the health-based soil screening criteria established for the RI[7]. Sample analysis results are presented in Table 14 of Appendix E.

Zulu Ranges (AOC 26) — Surface and subsurface soil samples were taken at the Zulu Ranges as part of the SI and RI. Figure 9 of Appendix A shows soil sampling locations in the Zulu Ranges. These samples were analyzed for TCL organics, TAL metals, explosives, and TPHC. Although several metals exceeded background concentrations in at least one surface and subsurface sample, none of the metals detected exceeded the health-based screening values. PAHs were detected in up to three surface and subsurface samples. One of the PAHs, benzo(b)fluoranthene (0.81 µg/g), exceeded the screening concentration[8](0.7 µg/g). RDX and TPHC were also detected. The maximum concentration of RDX in subsurface soil (38 µg/g) exceeded the health-based screening level[9](26 µg/g). Sample analysis results are presented in Table 15 and 16 of Appendix E.

Hotel Range (AOC 27) — Subsurface soil samples were collected from boreholes at the Hotel Range and analyzed for TPHC, TAL metals, explosives, and TCL organics. Figure 10 of

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[7] Either the Massachusetts Contingency Plan Human Health Level for Soil, the USEPA Region III Risk-Based Concentration, or, for lead, the level set in the *USEPA Interim Guidance on Soil Lead Cleanup Level.*

[8] Massachusetts Contingency Plan Human Health Level for Soil.

[9] USEPA Region III Risk-Based Concentration.

Appendix A shows borehole locations. None of the metals exceeded the screening values. Low levels of TPHC (maximum concentration of 75.6 µg/g), below the screening level of 5,000 µg/g, were detected in some samples. VOCs and pesticides were also detected at concentrations just above the detection limit. These levels were well below screening values. Sample analysis results are presented in Table 17 of Appendix E.

Complete analytical results are presented in the RI report.

VI. SUMMARY OF SITE RISKS

A risk assessment was performed to estimate the probability and magnitude of potential human health and environmental effects associated with exposure to contaminated media at the site. The following sections discuss the general approach and assumptions, the results of the human health risk evaluation, and the ecological risk evaluation.

A. Baseline Risk Assessment Approach and Assumptions

The human health risk assessment followed a four-step process: (1) contaminant identification, which identified those hazardous substances that, given the specifics of the site, were of significant concern; (2) exposure assessment, which identified actual or potential exposure pathways, characterized the potentially exposed populations, and determined the extent of possible exposure; (3) toxicity assessment, which considered the types and magnitude of adverse health effects associated with exposure to hazardous substances; and (4) risk characterization, which integrated the three earlier steps to summarize the potential and actual risks posed by hazardous substances at the site, including carcinogenic and noncarcinogenic risks. A summary discussion of the human health risk assessment approach is presented in Section 5 of the RI report, Volume I, while more detailed discussions are presented in Section 8 of Volumes II, III, and IV of the RI report for the EOD, Zulu, and Hotel Ranges, respectively.

All organic chemicals that were positively detected (detected concentrations not discounted for reasons explained in the RI report) were selected as contaminants of potential concern (COPCs) for the human health risk assessment. Some, notably pesticides which were widely applied in the past at Fort Devens, are probably not directly related to range activities. Also, organic compounds that could not be quantitatively eliminated during the Quality Control (QC) review as being not site-related, but were considered to be questionable, were still considered as part of the risk assessment. Tables 18, 19, and 20 of Appendix E present the COPCs for each sampled media at the EOD, Zulu, and Hotel Ranges, respectively. A summary of the health effects of each of the COPC can be found in Section 5, Volume 1 of the RI report.

Potential human health effects associated with exposure to the contaminants of concern were estimated quantitatively or qualitatively by developing several hypothetical exposure pathways. These hypothetical pathways were developed to reflect the potential for exposure to hazardous substances based on the present uses, potential future uses, and location of the site. The following is a brief summary of the exposure pathways evaluated for the human health risk and

ecological risk evaluations. A more thorough description can be found in Section 8 and 9 of Volumes II, III, and IV of the RI report for the EOD, Zulu, and Hotel Ranges, respectively.

1. Exposure Pathways for the Human Health Risk Evaluation

EOD Range (AOC 25)

- Direct contact (dermal contact and incidental ingestion) with contaminated surface soils
- Inhalation of airborne soil particles

Zulu Ranges (AOC 26)

- Direct contact (dermal contact and incidental ingestion) with contaminated surface soils
- Inhalation of airborne soil particles
- Direct contact with sediment and surface water in the adjacent wetlands

Hotel Range (AOC 27)

- Direct contact (dermal contact and incidental ingestion) with contaminated surface soils
- Inhalation of airborne soil particles
- Direct contact with contaminated sediment and surface water at Cranberry Pond

Groundwater in the vicinity of these ranges is not currently used as a water supply source, nor is it expected to be used for that purpose in the future; therefore, direct contact with groundwater is not a complete exposure pathway and was not addressed further in the risk assessment. Any future use of the SPIA monitored-area groundwater will require a human health risk assessment.

2. Exposure Pathways for the Ecological Risk Evaluation

EOD Range (AOC 25) — COPCs at the EOD Range include mercury, zinc, and nitroglycerin. The only medium of exposure is soil. The species selected as potentially exposed were herbaceous vegetation, white-footed mouse, killdeer, and red fox. The following pathways were identified as sources of potential exposure:

- Root uptake from contaminated soil

- Contact and absorption, incidental ingestion, and feeding on contaminated food and soil
- Bioaccumulation from vegetation or animal prey

Zulu Ranges (AOC 26) — COPCs identified at the Zulu Ranges include metals, explosives, and organics. Media of exposure include soils, sediments, and surface water. Selected terrestrial species were herbaceous vegetation, white-footed mouse, grasshopper sparrow, killdeer, and red fox. Selected aquatic and semiaquatic species were aquatic invertebrates, Blanding's turtle, and mink.

Terrestrial and aquatic pathways include the following:

- Root uptake from contaminated soil
- Contact and absorption, incidental ingestion, and feeding on contaminated food and soil
- Incidental ingestion and drinking of contaminated surface water
- Bioaccumulation from vegetation or animal prey

Hotel Range (AOC 27) — Antimony, copper, lead, mercury, nickel, and 4-amino-2,6-dinitro toluene were selected as ecological COPCs in Cranberry Pond sediments, which are potentially affected by activities at Hotel Range. Lead was selected as a COPC in surface water of Cranberry Pond. Selected species were aquatic invertebrates, raccoons, and mallard.

The following migration pathways were identified:

- Uptake from contaminated sediment
- Contact and absorption, incidental ingestion, and feeding on contaminated food and sediments
- Contact and absorption, incidental ingestion, and drinking of contaminated surface water
- Bioaccumulation from vegetation or animal prey

B. Baseline Risk Assessment Results

Excess lifetime cancer risks were determined for each exposure pathway by multiplying the exposure level with the chemical-specific cancer factor. Section 8 of Volumes II, III, and IV of the RI report present detailed descriptions of the exposure assumptions. USEPA has developed

cancer potency factors from epidemiological or animal studies to reflect a conservative "upper bound" of the risk posed by potentially carcinogenic compounds. That is, the true risk is unlikely to be greater than the risk predicted. The resulting risk estimates are expressed in scientific notation as a probability (e.g., 1 x 10^{-6} for 1/1,000,000) and indicate (using this example), that an average individual is not likely to have greater than a one in a million chance of developing cancer over 70 years as a result of site-related exposure to the compound at the stated concentration. Current USEPA practice considers carcinogenic risks to be additive when assessing exposure to a mixture of hazardous substances.

The hazard quotient was also calculated for each pathway as a measure of the potential for noncarcinogenic health effects. A hazard quotient is calculated by dividing the exposure level by the reference dose (RfD) or other suitable benchmark for noncarcinogenic health effects for an individual compound. USEPA has developed RfDs to protect sensitive individuals over the course of a lifetime. They reflect a daily exposure level that is likely to be without an appreciable risk of an adverse health effect. RfDs are derived from epidemiological or animal studies and incorporate uncertainty factors to help ensure that adverse health effects will not occur. The hazard quotient is often expressed as a single value (e.g., 0.3) indicating the ratio of the stated exposure as defined to the RfD value (in this example, the exposure as characterized is approximately one third of an acceptable exposure level for the given compound). The hazard quotient is only considered additive for compounds that have the same or similar toxic endpoint and the sum is referred to as the hazard index (HI). For example: the hazard quotient for a compound known to produce liver damage would not be added to a second compound whose toxic endpoint is kidney damage.

Under the current USEPA Superfund policy, acceptable exposures to carcinogens are those that represent an excess upper bound lifetime cancer risk of between 10^{-4} to 10^{-6}. For noncarcinogenic effects, acceptable exposures levels are those with a HI of 1.0 or less. Using the exposure assumptions described in the RI report and chemical concentration data obtained during the RI, the Baseline Risk Assessment evaluated both potential carcinogenic and noncarcinogenic risks to potentially exposed persons.

The human health risk assessment of the RI report identified the following potential human health risks:

SPIA Monitored-Area Groundwater - Actual use of Well D-1 groundwater by an individual occurs less than 14 days per year, far less frequently than the 350 days per year that is assumed for residential exposure. Actual exposure duration, which probably does not exceed 10 years, also is significantly less than the residential assumption of 30 years (which includes childhood). Given their limited exposures, the potential risks to the troops who currently use Well D-1 are estimated to be at least two orders of magnitude less than those estimated for residential tap water, lowering the excess lifetime cancer risks to current groundwater users from arsenic and chloroform below the lower extreme of the 10^{-4} to 10^{-6} range considered acceptable by USEPA. Therefore, groundwater at the South Post of Fort Devens does not pose any unacceptable risks to

human health. Table 21 of Appendix E shows the calculated risks for using Well D-1 groundwater.

EOD Range (AOC 25) — The estimated potential cancer risks under the case of "reasonable maximum exposure" (RME) to contaminants at the EOD Range ranged from 1.2×10^{-9} for a site worker's exposure to soil, to 1.7×10^{-8} for an adult trespasser's exposure to soil. These are all well below USEPA's benchmark 10^{-4} to 10^{-6} range. Table 22 of Appendix E presents a summary of the excess cancer risks associated with the EOD Range. The RME and the average exposure cases evaluated in the human health risk assessment were based on the maximum and average chemical concentrations in the exposure media, in accordance with USEPA-New England guidance. The cancer risks associated with average exposures were less than 33 percent of the RME risks.

The HIs for potential RME scenarios involving noncarcinogenic COPCs from the EOD Range ranged from 9.0×10^{-4} for site worker exposures to soil to 1.1×10^{-3} for the adolescent trespasser. All were well below USEPA's benchmark value of 1.0. Table 23 of Appendix E presents a summary of the estimated hazard indices for noncarcinogenic effects associated with the EOD Range.

Zulu Ranges (AOC 26) — The estimated potential cancer risks for RME's to contaminants at the Zulu Ranges ranged from 7.6×10^{-9} for an adolescent site trespasser's exposure to sediment to 8.9×10^{-8} for an adult's consumption of fish. These numbers are all below the 10^{-4} to 10^{-6} range. Table 24 of Appendix E presents a summary of the excess cancer risks associated with the Zulu Ranges. The RME case assumes that all of a receptor's exposure is to 33 maximum contaminant concentrations observed at site. For all of the pathways evaluated, the cancer risks associated with average exposures were approximately 25 percent as great as the RME risks.

Both the soil and sediment exposure pathways could reasonably apply to the same trespassers. In addition, the same individuals could fish from Slate Rock Pond. Therefore, the estimated risks from soil contact, sediment contact, and fish consumption were summed to estimate the total receptor risk. Combining the RME risk estimates from the three pathways results in total estimated cancer risks of 1.7×10^{-7} for adults and 4.1×10^{-8} for adolescents, still below the 10^{-6} level.

The HIs for potential RME scenarios involving noncarcinogenic COPCs from the Zulu Ranges ranged from 1.0×10^{-3} for adult trespasser exposure to soil to 3.3×10^{-3} for site worker soil exposures. All were well below USEPA's benchmark value of 1.0. The total HIs of trespassers from soil contact, sediment contact, and fish consumption pathways were also well below 1.0. Table 25 of Appendix E presents a summary of the estimated hazard indices for noncarcinogenic effects associated with the Zulu Ranges.

Hotel Range (AOC 27) — Estimated potential cancer risks for RMEs to contaminants at the Hotel Range ranged from 4.1×10^{-9} for an adolescent site trespasser's exposure to soil to 1.7×10^{-8} for an adult trespasser's exposure to sediment. These numbers are all below the 10^{-4} to 10^{-6}

range. Table 26 of Appendix E presents a summary of the excess cancer risks associated with the Hotel Range. The RME case assumes that all of a receptor's exposure is to the maximum contaminant concentrations observed at the site. For soil exposure pathways, the cancer risks associated with average exposures were up to a 33 percent less than the RME risks. Cancer risks associated with average exposures to sediments were less than the RME risks by an order of magnitude.

Both the soil and sediment exposure pathways could reasonably apply to the same site trespassers. Therefore, the estimated risks from soil and sediment contact were summed to estimate the total receptor risk. Combining the RME risk estimates from these two pathways results in total estimated cancer risks of 1.4×10^{-7} for adults and 3.2×10^{-8} for adolescents, still well below the 10^{-6} level.

The HIs for potential RMEs to carcinogenic COPCs for the Hotel Range ranged from 7.7×10^{-4} for the adult trespasser exposures to soil to 1.9×10^{-2} for site worker soil exposures. All were well below USEPA's benchmark value of 1.0. The total HIs of trespassers from soil and sediment contact pathways together were also well below 1.0. Table 27 of Appendix E presents a summary of the estimated HIs for noncarcinogenic effects associated with the Hotel Range.

C. Ecological Risk Assessment

An ecological risk assessment was performed for the SPIA monitored-area. The following sections present a summary of the results of the ecological risk evaluations.

SPIA Monitored-Area Groundwater — Groundwater from within the SPIA monitored-area is discharging to on-site surface waters prior to leaving the South Post. No ecological risk to surrounding habitats are associated with groundwater in the SPIA monitored-area. Ecological impacts from the surface water/sediment for each individual range are described within this ROD in the following sections.

EOD Range (AOC 25) — Concentrations of mercury, zinc, and nitroglycerin in soils exceed USEPA guidelines for plants or small mammals, but only for the worst case scenario. Ecological risks identified on the EOD Range were deemed acceptable due to the continued use of the Impact Area for military training activities. Table 28 of Appendix E presents, for the average exposure case, a summary of the hazard quotients for endpoint species at the EOD Range. Table 29 of Appendix E presents a summary of hazard quotients for the RME case.

Zulu Ranges (AOC 26) — Levels of lead, zinc, and cyclonite in soils exceed USEPA risk guidelines for plants, small mammals, and songbirds. Several metals were detected in the sediments of the nearby wetlands at levels above local background concentrations. Despite some exceedances, these metals were not considered to be of concern because exceedances of background or criteria were few and the magnitude of exceedance was not great. Ecological risks identified on the Zulu Range were deemed acceptable due to the continued use of the Impact Area for military training activities. Tables 30 and 31 of Appendix E present, for the average exposure

case, a summary of the hazard quotients for aquatic and terrestrial endpoint species at the Zulu Ranges, respectively. Tables 32 and 33 present, for the RME case, a summary of hazard quotients for aquatic and terrestrial endpoint.

Lead and other chemicals found in the surface water do not pose significant risks to wildlife or to aquatic life. Levels of lead exceed water quality criteria, but water samples were not toxic when tested in the laboratory with aquatic invertebrates and fish.

Hotel Range (AOC 27) — Metals, explosives, and other organic chemicals found in soils at the Hotel Range do not pose unacceptable risks to plants or wildlife. Levels of lead exceed water quality criteria; however comparable water samples from the Zulu Range, which also contains elevated levels of lead, were not toxic when tested in the laboratory with aquatic invertebrates and fish. Several metals were detected in the sediments of Cranberry Pond at levels above local background concentrations. Despite some exceedances, these metals were not considered to be of concern because exceedances of background or criteria were few and the magnitude of exceedance was not great. In addition, the highest detected concentrations of these metals were within or only slightly exceeded the range of regional background levels reported for remote New England and for unimpacted lakes and ponds in Massachusetts. Ecological risks identified on the Hotel Range were deemed acceptable due to the continued use of the Impact Area for military training activities. Table 34 of Appendix E presents, for the average exposure case, a summary of the hazard quotients for aquatic endpoint species at the Hotel Range. Table 35 presents a summary of the hazard quotients for the RME case.

The assessment concluded that explosives and other chemicals in the soil do not pose unacceptable risks to plants or wildlife. In addition, lead, zinc, and other chemicals in the surface water pose no unacceptable ecological risk.

VII. ARMY RATIONAL FOR PROPOSING "NO ACTION"

The 1991 Defense BRAC Report to the President indicates that the Army will retain the South Post and continue operating its training ranges. Therefore, the South Post will not be cleaned up for unrestricted use. The Army Range Control will continue to restrict public access, and unauthorized personnel will be prohibited. Currently, the South Post is enclosed by a fence and access can only be gained through gates that are controlled by the Army Range Control.

Risk assessment results show that human health risks identified are within USEPA risk guidelines. Risk to on-site ecosystems were deemed acceptable.

VIII. DESCRIPTION OF THE NO ACTION ALTERNATIVE

"No action" is the selected remedy for the SPIA monitored-area groundwater and AOC 41 groundwater. Under this alternative, no formal remedial action is taken and the site is considered to be left "as is," with no additional institutional controls, containment, removal, treatment, or other mitigating measures. "No action" is also the selected remedy for the surface water,

sediment, and soil at the EOD, Zulu, and Hotel Ranges. The Army has submitted a Closure Report under the RCRA Subpart X; formal approval of the closure of EOD Range will occur prior to ROD signature.

As part of this remedy, Fort Devens will ensure the following:

- Groundwater monitoring for potential contaminant migration out of the SPIA monitored-area will continue:
  - Wells will be used to monitor the groundwater from the EOD Range, Zulu Ranges, Hotel Range, and AOC 41.
  - Wells will be used to monitor the north, northeast, southeast, and east sides of the SPIA monitored-area.
- The monitoring wells will be sampled for explosives, TCL, and TAL metals.
- A Groundwater Monitoring Plan for the South Post will be developed that will include detailed groundwater monitoring at discharge points. The plan may include installing sentinel wells to monitor potential off-site groundwater flow. Details of the plan will be developed jointly by the Army, USEPA-New England, and MADEP within 6 months of ROD signature. The Army will rerun the groundwater model to incorporate data from new sentinel well(s) and ascertain any potential impacts to MCI Shirley.
- Well D-1 will be sampled and analyzed for explosives and Massachusetts and Federal drinking water requirements (MMCLs/MCLs).
- The Army will not develop new drinking water sources within the SPIA monitored-area.
- An Integrated Natural Resources Management Plan will be developed and implemented to monitor the impacts to ecosystems in the SPIA monitored-area. The details of this plan will be developed jointly by the Army, USEPA-New England, U.S. Fish and Wildlife Service, and MADEP within 6 months of the ROD signature.

Monitoring reports will include a description of site activities and a summary of analytical results. The Army will review and submit these monitoring reports to MADEP and USEPA annually. If there is an indication of contamination emanating from the SPIA monitored-area, the Army will evaluate the need for additional assessment.

This site, as required by CERCLA, will be subject to 5 year reviews. During a 5 year review, an assessment is made as to whether the implemented no action alternative remains protective of

human health and the environment and whether the implementation of alternative remedial actions are needed to ensure adequate protection. If on-site hazardous substances, pollutants, or contaminants that may present an imminent and substantial endangerment to public health and welfare migrate off site, the Army will take the necessary and appropriate actions to protect human health and the environment as required under CERCLA. More frequent reviews will be conducted if site conditions change. Should the Army close or transfer or change the use of this property, an Environmental Baseline Survey (EBS) will be conducted, and the "no action" decision of this ROD will be re-examined in light of the changed use and risk factors resulting from this closure/transfer. The EBS will be provided to the USEPA-New England and MADEP for comment.

The implementation of the "no action" alternative will cost approximately $500,000.

IX. DOCUMENTATION OF SIGNIFICANT CHANGES

The Army presented a Proposed Plan identifying "no action" as the preferred alternative for the site. The plan was presented at a public meeting held on February 21, 1996. Comments obtained from the public were incorporated into the development of this Final ROD for the SPIA monitored-area groundwater and AOCs 25, 26, and 27. Concurrent to the development of this ROD, the Army was finalizing the RI for AOC 41. AOC 41 is approximately 6-acres in size and is located between Harvard Road, New Cranberry Road, and an eastern portion of the SPIA monitored-area (Figure 11 of Appendix A shows the location of a AOC 41).

The results of the AOC 41 RI indicate that the most appropriate remedial action for the groundwater at AOC 41 would be "no action." This is the same action to be taken for the SPIA monitored-area groundwater. The RI also shows that AOC 41 is adjacent to the SPIA monitored-area, and AOC 41 is small in area (6 acres). Adding AOC 41 to this ROD would only increase the total land area covered in this ROD by 0.6 percent. Therefore, the USEPA-New England recommended including AOC 41 in this ROD. The landfill portion of AOC 41 will be addressed under a separate action.

The overall result of including AOC 41 groundwater with the SPIA monitored-area groundwater is that a slightly larger land area is addressed, and the Army can more rapidly proceed in the development and implementation of the long-term monitoring programs for the site. A Groundwater Monitoring Plan for the South Post will be developed that will include monitoring the groundwater under AOC 41. The plan may include installing sentinel wells to monitor potential off-site groundwater flow. Details of the plan will be developed jointly by the Army, USEPA-New England, and MADEP within 6 months of ROD signature.

A. Site History

AOC 41 is approximately 6 acres in size and is located between Harvard Road, New Cranberry Pond, and an eastern portion of the impact area in the South Post (Figure 11 of Appendix A). The landfill material occupies an area approximately 75 feet by 75 feet in the central portion of the

site. It appears to have been associated with an old brick-making kiln that was operated in this area in the 1800s. The AOC is overgrown with trees and swampy vegetation, and no records are available detailing when the site was used or what type of material was disposed of in this area. It is believed that this AOC was used until the 1950s for disposal of nonexplosive military and household debris. Miscellaneous debris is scattered over a small hill located approximately 75 feet north of New Cranberry Pond. The hill slopes down to a low area at the base of the hill. The ground surface elevation rises to the south, then slopes again down to New Cranberry Pond. The water level in New Cranberry Pond is controlled by a culvert located on the eastern shore of the pond that impedes the water flow, which in turn increases the water level in the pond. Installation personnel attempt to keep the culvert clear in an effort to maintain a constant water level in the pond.

The results of the SI and Supplemental SI (SSI) indicated that some residual surface soil contamination was present on the waste material. However, the main human health risk was associated with the concentration of chlorinated solvents found in the groundwater. SA 41 was recommended for an RI/FS after the SSI and the site designation was changed from SA 41 to AOC 41. The RI for AOC 41 concentrated on defining the distribution of chlorinated solvents in groundwater. The findings of the RI indicate that (1) the waste material is not the source of the groundwater contamination, (2) the source of the groundwater contamination appears to be within the area investigated, (3) groundwater contaminant distribution is well defined, and (4) contamination does not appear to be impacting the surface water or sediment quality in New Cranberry Pond.

B. Summary of Site Characteristics

The following subsections address the nature and distribution of analytes detected in soil and groundwater during the 1992 SI, 1993 SSI, and 1994 RI. In addition to the off-site analytical laboratory analysis, field analytical data is presented and discussed. Table 36 presents a list of the analytical tests performed on each sample in each media during the SI, SSI, and RI. Figure 12 and 13 of Appendix A show the soil and groundwater sampling locations for field and off-site laboratory analysis.

1. Soils

The soil type encountered in one boring advanced at AOC 41 included clayer silt from 4 to 36 feet below ground surface. This material was mapped as Ayer Stage lake deposits.

Field Analytical Results — Samples for field analysis collected as part of the RI include: 22 soil gas samples from 13 locations; 30 soil samples from the 13 soil gas survey points; 12 soil samples from 5 test pits; and 14 soil samples from the installation of one monitoring well.

Field analytical results indicate that 2 of the 13 soil gas samples contained detectable levels of trichloroethylene (TCE) (3.6 parts per billion (ppb) and 3.9 ppb). TCE and trans-dichloroethylene (DCE) were detected in soil samples collected from the soil gas sampling points

between 30 and 37 feet below ground surface. Values of TCE ranged from less than the analytical detection limit (1.0 ppb) to 180 ppb while trans-DCE concentrations ranged from below detection limit to 9.1 ppb. The vertical distribution of observed TCE contamination coincides with the depth of the water table at this area. None of the soil samples collected from the test pits indicated the presence of any target analyte. Of the 14 soil samples collected during the installation of the monitoring well, only those collected at 30 to 32, 35 to 37, and 40 to 42 feet below ground surface contained TCE (4.55 ppb, 5.33 ppb, and 8.58 ppb respectively). This data also suggests a correlation between the vertical distribution of contamination and the depth to groundwater at this site.

The field analytical results for the soil gas samples, the soil samples collected at soil gas survey points, the soil samples from the test pits, and the soil samples from the installation of one monitoring well are presented in Tables 37, 38, 39, and 40 of Appendix E, respectively.

Off-Site Laboratory Results — Soil samples were collected for off-site laboratory analysis from test pits and monitoring well boring locations completed during the SI, SSI, and RI. VOCs, pesticides/PCBs, and explosives were not detected in any of the soil samples collected during the SI and SSI. Sodium was the only inorganic attribute detected above Fort Devens background in all soil samples. Other analytes detected above background include calcium, copper, and nickel. The results of these analysis are presented in Table 41 of Appendix E.

Twelve of the 21 soil samples collected during the RI were analyzed for VOC, semivolatile organic compounds (SVOC), inorganics, toxicity characteristic leaching procedure (TCLP), TPHC, and TOC. The remaining 9 samples were analyzed for all of the previously listed parameters except TCLP.

Off-site analytical results indicate that only 1 of the 17 samples collected from potential groundwater contamination test pits contained VOCs (1,1,2,2-trichloroethane (TCA) and toluene). A review of laboratory quality control indicates that the Freon and toluene detected in samples beneath the waste material and the remaining detected VOC can be attributed to laboratory contamination. SVOCs (acenaphthylene, benzo[b]fluoranthane, benzo[k]fluoranthane, chrysene, fluoranthane, phenanthrene, and pyrene) were detected at low concentrations in 3 of these 17 soil samples.

Cobalt, copper, nickel, and sodium exceeded Fort Devens background in 4 samples while sodium exceeded background in all 12 samples analyzed using TCLP; but each sample passed the TCLP.

The off-site analytical results for the soils analysis are presented in Table 41 of Appendix E.

2. Groundwater

Groundwater samples were collected in six separate rounds at this site (Rounds 1 through 6).

Field Analytical Results — Groundwater samples were collected for field analysis only during the 1994 RI field program. Field analysis of groundwater samples consisted of collection and analysis of groundwater samples from screened auger borings and all pre-1994 monitoring wells. Each of the groundwater samples was analyzed with field gas chromatography (GC) for vinyl chloride; t-1,2-DCE; c-1,2-DCE; benzene; TCE; toluene; TCA; ethylbenzene; m/p xylene; o-xylene; 1,1,2,2-TCA; and 1,2-DCE.

Based on field analytical data, the site-related VOC (TCE, 1,1,2,2-TCA, and c-1,2-DCE) plume appears to be vertically confined to the soils at the water table, and centered along a line trending northeast to southwest. Figures 14 and 15 of Appendix A show the interpretive field analytical concentration contours for TCE and 1,1,2,2-TCA in groundwater, respectively.

The results of the 1994 RI sampling analysis are presented in Table 42 of Appendix E.

Off-Site Laboratory Results — Two rounds of off-site laboratory analytical samples were collected during each of the field investigations conducted at AOC 41.

Off-site analytical results for groundwater samples collected during rounds 1 and 2 (September 1992 and January 1993, respectively) indicate that several VOC (TCE, tetrachloroethylene (PCE), and 1,1,2,2-TCA) were present in the groundwater. One explosive-related compound (2,4,6-trinitrotoluene) was detected in round 1 but not round 2, while one pesticide (eldrin) was detected in round 2 but not round 1. No other VOC, SVOCs, pesticides/PCBs, or TPHC were detected in either round. The results of the rounds 1 and 2 sampling analysis are presented in Table 43 of Appendix E.

Five additional monitoring wells were installed between round 2 and 3. Off-site analytical results for groundwater samples collected during rounds 3 and 4 (October 1993 and January 1994, respectively) indicate that VOC (TCE, 1,1,2,2,-TCA, 1,2-DCE) were detected in the previously existing well and 2 of the new monitoring wells. Nitroglycerine was detected in 1 well during round 4. SVOCs detected during both rounds were identified as laboratory contaminants. Several inorganic analytes (antimony, arsenic, and manganese) were detected at concentrations slightly above Fort Devens background in unfiltered samples. The results of the rounds 3 and 4 sampling analysis are presented in Table 43 of Appendix E.

Eleven additional wells were installed as part of the RI field investigation. Two rounds (5 and 6) of groundwater samples were collected during the RI field investigation. Round 5 was completed in December 1994 and round 6 was completed in March 1995. Off-site analytical results for groundwater samples indicate that several VOC (TCE, PCE, 1,1,2,2-TCA, cis- and trans-1,2-DCE, toluene, carbon tetrachloride, and carbon disulfide) were detected in one or more wells during either or both rounds. The only SVOC detected appears to be attributable to laboratory contamination.

Each of the PAL inorganic analytes, except for mercury, was detected above its Fort Devens background concentrations in the unfiltered groundwater samples. However, results for filtered

inorganic samples indicated that only antimony, arsenic, potassium, copper, manganese, magnesium, sodium, and zinc were detected above Fort Devens background.

The results of all sampling analysis are presented Table 43 of Appendix E.

C. Summary of Groundwater Impacts

The groundwater results of Rounds Five and Six at AOC 41 indicate the presence of several VOCs (TCE; PCE; 1,1,2,2-TCA; cis- and trans-1,2-DCE; toluene; carbon tetrachloride; and carbon disulfide) and several inorganic analytes above their Fort Devens background concentrations in unfiltered samples. The distribution and relative concentration of the VOC contaminants is consistent in both field and off-site laboratory results. This observation is the most significant feature of the contamination assessment at this site. The groundwater is contaminated with VOCs, but the distribution of that contaminant plume appears to be well defined. The source of this VOC contamination, particularly the chlorinated solvents, has not been precisely located; however, it does appear to be within the area investigated during the RI. It is important to note that the VOC contamination appears to have almost no movement based upon the consistent contaminant values and the lack of contamination in down gradient monitoring wells (i.e., 41M-94-09A, 41M-94-09B, 41M-94-11X, and 41M-94-12X).

The hydrogeologic data collected at the site indicates that groundwater flow is slow, generally less than 1 foot per year, and therefore contaminant migration would be within a similar order of magnitude.

D. Summary of Risks

The focus of the baseline human health risk assessment for AOC 41 is the groundwater operable unit at AOC 41. Other media including soil, sediment, and surface water were sampled in earlier investigations, but were not included in the baseline risk assessment. Based on the findings presented RI report and previous investigations (see Appendix C — Administrative Record), it appears that the groundwater contamination source is within AOC 41, but is not the waste material.

Groundwater associated with AOC 41 is not currently used for drinking water or for any other purpose. Except for the Fort Devens South Post Water Point (Well D-1), groundwater on the South Post (where AOC 41 is located) does not represent a current or potential future source of drinking water.

Groundwater supplies at Fort Devens have consistently met Massachusetts water quality standards. Except for sodium, the physical and chemical qualities of on-site potable water have complied with State standards. The installation has been complying with the State regulation for reporting sodium concentrations in excess of 20 milligrams per liter (mg/L). The sodium notification requirement is designed to alert persons on a sodium-restricted diet of high sodium levels in their drinking water.

The noncarcinogenic risks (as hazard indices) and carcinogenic risks associated with the analytes detected in Well D-1 were calculated and are reported in Table 21 of Appendix E. The exposure frequency was assumed to be 14 days per year. Cancer risks were calculated for two possible exposure durations: 10 years, which is probably greater than any individual exposure, and 2 years, which is more typical.

A USEPA Office of Solid Waste and Emergency Response (OSWER) directive, *The Role of Baseline Risk Assessment in Superfund Remedy Selection Decisions*, indicates that action is generally warranted at a site when carcinogenic risks are greater than $1x10^{-4}$ or noncarcinogenic HIs exceed 1 (based on RME assumptions). USEPA Superfund guidelines also state that when the total incremental carcinogenic risk for an individual resulting from exposure at a hazardous waste site is within the range of $1x10^{-4}$ to $1x10^{-6}$, a decision about whether to take action or not is a site-specific decision. This range of $1x10^{-4}$ to $1x10^{-6}$ is often referred to as the Superfund target risk range.

All of the HIs are well below the USEPA threshold of 1, indicating that there are no unacceptable noncarcinogenic health risks. The carcinogenic risks are all below $1x10^{-4}$. For one exposure scenario, assuming a 10-year exposure duration, the cancer risk slightly exceeds $1x10^{-6}$, at $1.3x10^{-6}$. This cancer risk is, however, at the low end of the Superfund target risk range.

The RI concludes that there are no unacceptable risks to human health from the groundwater at the South Post Well D-1 and that no further action would be required under CERCLA.

An evaluation of health risks associated with exposure to soil at AOC 41 is not included in the baseline risk assessment. Surface soil at AOC 41 will be addressed separately under the Fort Devens landfill consolidation study. Subsurface soil will not be addressed in the baseline risk assessment due to the lack of an exact location of a contaminant source area.

Data collected from surface water and sediment at New Cranberry Pond during previous investigations demonstrates that surface water from New Cranberry Pond recharges groundwater below AOC 41. Therefore, it appears that site-related contaminants from AOC 41 are not impacting ecological receptors in New Cranberry Pond.

E. The Army's Rational for Proposing the Preferred Alternative

The 1991 Defense BRAC Report to the President indicated that the Army will retain the South Post and continue operating its training and detonation ranges. Therefore, the contaminants detected in the South Post groundwater will not be cleaned up for unrestricted use.

Groundwater from AOC 41 is flowing to the north-northeast and would eventually discharge to the Nashua River. No ecological risk to surrounding habitats in New Cranberry Pond have been identified.

No potential threats to human health and the environment are associated with the groundwater at Well D-1 (which is the only present and planned future exposure point closest to AOC 41); therefore, the "no action" alternative is proposed. The same pathways will also exist under future site conditions since the land use is expected to remain unchanged. The Army will maintain the South Post, AOC 41 and associated ranges, continue training, maintain security, and develop long-term Integrated Natural Resources Management and Groundwater Monitoring Plans. These plans will incorporate the SPIA monitored-area groundwater, AOC 41 groundwater, and AOCs 25, 26, and 27 and will be developed within 6 months of ROD signature.

The Groundwater Monitoring Plan will include the installation of sentinel wells to monitor the groundwater. Details of the monitoring plan will be developed jointly by the Army, USEPA-New England, and MADEP.

Monitoring reports will include a description of site activities and a summary of analytical results. Reports will be submitted to MADEP and USEPA. Under CERCLA, any action that results in contaminants remaining on-site must be reviewed at least every 5 years. During 5-year reviews, an assessment is made of whether the no action alternative remains protective of human health and the environment and whether the implementation of additional remedial actions are appropriate.

Based on current information and analysis of the SI, SSI, and RI reports, the Army believes that the preferred alternative of "no action" for control of groundwater contamination at AOC 41 is consistent with the requirements of the Superfund law and its amendments, specifically Section 121 of CERCLA, and to the extent practicable, the NCP. No action is necessary to ensure protection of human health and the environment.

X. STATE ROLE

The Commonwealth of Massachusetts has reviewed the various alternatives and concurred with the selected remedy for the SPIA monitored-area groundwater and EOD Range, Zulu Ranges, and Hotel Range. The State has also reviewed the RI and Risk Evaluation to determine if the selected remedy is in compliance with applicable or relevant and appropriate State environmental laws and regulations. A copy of the declaration of concurrence is attached as Appendix B.

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RECORD OF DECISION SUMMARY
SOUTH POST IMPACT AREA AND
AREA OF CONTAMINATION 41 GROUNDWATER AND
AREAS OF CONTAMINATION 25, 26, AND 27
FORT DEVENS, MASSACHUSETTS

APPENDIX F

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

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LIST OF ACRONYMS

AOCs	areas of contamination
AOC 25	The Explosive Ordnance Disposal Range
AOC 26	The Zulu Ranges
AOC 27	The Hotel Range
AWQC	Ambient Water Quality Criteria
BRAC	Base Realignment and Closure
CAC	Citizens Advisory Committee
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPCs	contaminants of potential concern
DCE	Dichloroethylene
EBS	Environmental Baseline Survey
EOD	Explosive Ordnance Disposal
FS	Feasibility Study
HI	hazard index
HMW	Hinkley-Merrimac-Windsor
HMX	cyclotetramethylene tetranitramine
IAG	Federal Facilities Interagency Agreement
IRP	Installation Restoration Program
MADEP	Massachusetts Department of Environmental Protection
MCL	Maximum Contaminant Level
MEP	Master Environmental Plan
MMCLs	Massachusetts Maximum Contaminant Level
MUSEPA	Massachusetts Environmental Policy Act
NCP	National Contingency Plan
NPL	National Priorities List
OB/OD	Open burn/open detonation
OSWER	Office of Solid Waste and Emergency Response
PA	Preliminary Assessment
PAH	polycyclic aromatic hydrocarbons
PCE	Tetrachloroethylene
PETN	pentaerythritol tetranitrate
ppb	parts per billion
QC	Quality Control
RAB	Restoration Advisory Board
RCRA	Resource Conservation and Recovery Act
RDX	cyclonite
RfD	reference dose
RI	Remedial Investigation
RME	Reasonable maximum exposure
ROD	Record of Decision
SARA	Superfund Amendments and Reathorization Act
SAs	study areas
SI	Site Investigation
SSI	Supplementary Site Investigation
SPIA	South Post Impact Area
SVOC	Semivolatile organic compounds
TAL	Target Analyte List
TCA	Trichloroethane
TCE	Trichloroethylene
TCL	Target Compound List
TCLP	Toxicity characteristic leaching procedure

TNT	trinitrotoluene
TOC	total organic carbon
TPHC	total petroleum hydrocarbons
TRC	Technical Review Committee
USAEC	U.S. Army Environmental Center
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compounds
µg/L	micrograms per liter